

Attachment B

**STREAM CROSSING CHARACTERIZATION
AND SCOUR AND EROSION HAZARD
ASSESSMENT**

BRADWOOD LANDING PIPELINE

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1.0 INTRODUCTION

The following summarizes stream survey data and observations collected during site visits in Spring of 2005. These characterizations encompass only those water bodies thought to provide fish habitat, based upon stream order, connectivity to known fish habitat, and fish passage barrier information. Where permission to access streams on or through private land was not granted, crossing locations could not be surveyed and are identified as “No Access”. These streams will be surveyed in the future once access is obtained. Descriptions of other waterbodies crossed can be found in Attachment D Wetland Delineation Report.

2.0 METHODS

The proposed project requires consultation with the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act (ESA). To initiate consultation, a Biological Assessment (BA) will be prepared and submitted. It will address potential impacts to federally listed threatened and endangered species and their habitats, species proposed for listing, candidates for listing, and designated and proposed critical habitat. The analytical framework employed by NMFS for evaluating potential impacts to fish habitat is the Matrix of Pathways and Indicators (MPI). The MPI method examines habitat criteria (“indicators”) at the watershed level. Each indicator is determined to be either “Properly Functioning,” “At Risk,” or “Not Properly Functioning” based on established thresholds. Additionally, an evaluation of project impacts on Primary Constituent Elements (PCE) requires site-specific information. PCEs include sites essential to support one or more life stages used by listed species, such as sites for spawning, rearing, migration and foraging. These sites in turn contain physical or biological features essential to the conservation of the Distinct Population Segment and/or Evolutionarily Significant Unit; for example, spawning gravels, water quality and quantity, side channels, forage species.

In the absence of existing site-specific data, a combination of desktop watershed assessment using existing data in combination with project-specific field assessment data will provide a more accurate assessment of baseline habitat conditions that may be impacted by the proposed action. This data collection will be integral to submitting a complete BA to NMFS as well as a complete permit package to the US Army Corps of Engineers (Corps) and other permitting agencies in Oregon and Washington. Additionally, Resource Reports prepared for the Federal Energy Regulatory Commission (FERC) need to classify habitats impacted by the proposed action in the terms of the Oregon Department of Fish and Wildlife (ODFW) Habitat Mitigation Policy and for Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) requirements.

Existing Data Sources:

To the greatest extent practicable, existing data will be collected and utilized to establish baseline conditions at the various stream crossings. Existing data sources include, but are not limited to, watershed assessments, limiting factors analyses, stream habitat surveys/inventories, spawner and juvenile salmon data, Biological Opinions, and Environmental Impact Statements/Environmental Assessments. This data is necessary for impact analysis and to guide mitigation and conservation goals. Use of existing data is proposed as an analytical tool to facilitate project schedule and minimize project costs associated with lengthy field assessment and inventory efforts. However, at a minimum, all stream crossings will be evaluated in the field by a qualified fisheries biologist with experience in stream habitat assessments.

Desktop Data Assessment:

Some elements of the MPI and PCE are best addressed via off-site methods such as Geographic Information Systems (GIS) analysis, air photo interpretation, data queries, and contact with resource specialists. These elements are: changes to the hydrograph, road network density, watershed disturbance history, riparian reserve quality, refugia availability, chemical contamination as reflected in CWA 303(d) listings, and any limitations to habitat access. A

narrative description of each stream crossing will indicate off-site data sources utilized in analysis.

Field Assessment:

A number of physical habitat characteristics need to be assessed based on field investigations. We propose to use the U.S. Environmental Protection Agency's (EPA) Wadeable Streams Assessment (WSA) for application at perennial stream crossings occurring in Oregon and Washington. This methodology was selected because it is a robust, discrete sub-sampling method that quantitatively and qualitatively evaluates stream quality at the site-specific, reach, and watershed levels. The WSA methods have been modified to fit with project data needs and site access restrictions.

For this project, a "survey reach" of 200 feet will be established (100 feet upstream and downstream of the proposed pipeline corridor "centerline"). Because property access beyond the survey reach is restricted, the methods will be contained within the 200 foot pipeline corridor study area. Field assessment will employ one of two methodologies, depending on whether a given waterbody has known ESA listed fish runs or constitutes designated critical habitat for a listed species. For streams without ESA listed fish runs or designated critical habitat, the Rapid Habitat Assessment (RHA) component of the WSA methods will be employed. The RHA involves a quasi-quantitative method for evaluating a range of habitat characteristics, such as embeddedness, velocity/depth regime, channel alteration, bank stability, riffle frequency, etc. Attachment A, of this document, contains a copy of the RHA data forms.

For those stream with known ESA listed fish runs, designated critical habitat, or for streams lacking definitive information on the presence of ESA listed runs, but with a reasonable expectation of such runs, the WSA method will be employed. Additionally, the WSA methods may be applied to high-quality or unique habitats for resident native, non-listed species at the discretion of the task lead. Attachment B, of this document, contains a copy of the WSA data forms. The entire WSA methodology is available for download at: http://www.epa.gov/owow/monitoring/wsa/wsa_fulldocument.pdf.

For some waterbodies, sufficient information may exist for a given stream reach, which may preclude the need for the WSA methods. In such circumstances, existing data will be supplemented with specific elements of the WSA sufficient for completeness and consistency of analysis. Given the variation in existing data for any particular stream crossing, each case will be evaluated on a case-by-case basis. At the very least, a biologist will visually inspect all stream crossings, employ the RHA method, and corroborate existing data with field conditions. In cases where data may be dated or stream conditions have been significantly influenced by natural or anthropogenic influences since source data was collected, the WSA methods will be employed.

The complete WSA methodology includes procedures for collecting field measurement data and/or acceptable index samples for several response and stressor indicators, including water chemistry, physical habitat, and benthic macroinvertebrate assemblages. Collection of water chemistry data and benthic macroinvertebrate assemblages will exceed the data needs required to complete the MPI, PCE and ODFW Habitat Mitigation Policy. Therefore, these analysis tools are not proposed for this investigation.

Collection of physical habitat data will follow the WSA methods with one notable exception: the total number of survey transects will be reduced from eleven to three. The reduction in transects

reflects the need to characterize habitat immediately within and adjacent to the proposed stream crossing and construction limits, and access restrictions on private land. It is understood that reducing the number of transects will correspondingly reduce the statistical robustness of the overall methodology; however, it is believed that the resulting level of analysis will still exceed data needed to accurately extrapolate site characteristics to general reach-level habitat trends. When coupled with Desktop Data Assessment and Existing Data Sources, a scientifically valid and defensible assessment of baseline environmental conditions can be applied to the needs described above.

Rapid Habitat Assessment Method:

The RHA method will be employed on those perennial and ephemeral stream crossings that do not contain ESA listed fish runs or designated critical habitat. One of the two Rapid Habitat Assessment forms is completed; either the Riffle/Run-Stream form or the Glide/Pool-Stream form. Ten habitat parameters are then assigned a value based on habitat condition categories ranging from Optimal, Sub-Optimal, Marginal, and Poor. Each habitat condition category is defined by quantifiable measures.

It is understood that by generalizing habitat measures to estimations disconnects such data from any form of quantitative analysis. The purpose of the Rapid Habitat Assessment method is to provide an evaluation framework that is consistent in terminology and physical habitat characteristics assessed. In circumstances where significant habitat change occurs within the survey reach, such habitat will be noted in comments.

Wadeable Streams Assessment Method:

The following description of the WSA is taken from EPA's *Wadeable Stream Assessment: Field Operations Manual* (USEPA 2004).

The WSA program focuses on the use of consistent scientific and technical tools for evaluating ecological conditions on regional and national scales. The methods were initially developed and tested during 5 years of pilot and demonstration projects (1993 - 1997) and modified for use in a study of streams in the Western US (2000-2002). These projects were conducted under the sponsorship of the EPA and its collaborators through the Environmental Monitoring and Assessment Program (EMAP). The result is a Wadeable Streams Assessment (WSA) Program that consists of a comprehensive program for surveying, assessing, and diagnosing ecological condition. A determination of related causes and sources of degradation to aquatic resources can be investigated. The methods are based on the guidelines developed and followed in the Western Environmental Monitoring and Assessment Program (Peck et al. 2003).

Physical habitat in streams includes all those physical attributes that influence or provide sustenance to organisms within the stream. Stream physical habitat varies naturally, as do biological characteristics; thus, expectations differ even in the absence of anthropogenic disturbance. Within a given physiographic-climatic region, stream drainage area and overall stream gradient are likely to be strong natural determinants of many aspects of stream habitat, because of their influence on discharge, flood stage, and stream power (the product of discharge multiplied by gradient). Kaufmann (1993) identified seven general physical habitat attributes important in influencing stream ecology:

1. Channel Dimensions

2. Channel Gradient
3. Channel Substrate Size and Type
4. Habitat Complexity and Cover
5. Riparian Vegetation Cover and Structure
6. Anthropogenic Alterations
7. Channel-Riparian Interaction

All of these attributes may be directly or indirectly altered by anthropogenic activities. Nevertheless, their expected values tend to vary systematically with stream size (drainage area) and overall gradient (as measured from topographic maps). The relationships of specific physical habitat measurements described in this section to these seven attributes are discussed by Kaufmann (1993). A comprehensive data analysis guide (Kaufmann et al., 1999) discusses the detailed procedures used to calculate metrics related to stream reach and riparian habitat quality from filed data collected using these field protocols.

These procedures are intended for evaluating physical habitat in wadeable streams. The following field procedures are most efficiently applied during low flow conditions and during times when terrestrial vegetation is active, but may be applied during other seasons and higher flows except as limited by safety considerations. This collection of procedures is designed for monitoring applications where robust, quantitative descriptions of reach-scale habitat are desired, but time is limited. . . . The protocol was made as objective and reproducible as possible, by using easily learned, repeatable measures of physical habitat in place of estimation techniques wherever possible. Where estimation is employed, the sampling team is directed to estimate attributes that are otherwise measurable, rather than estimating the quality or importance of the attribute to the biota or its importance as an indicator of disturbance. More traditional visual classification of channel unit scale habitat types are included in the WSA program because they have been useful in past studies and enhance comparability with other work.

The time commitment to gain repeatability and precision is greater than that required for more qualitative methods. In field trials, two people typically completed the specified channel, riparian, and discharge measurements in about 3.5 hours of field time. However, the time required can vary considerably with channel characteristics. On streams up to about 4 meters wide with sparse woody debris, measurements can be completed in about two hours.

The procedures are employed on a sampling reach length 40 times its low flow wetted width. Measurement points are systematically placed to statistically represent the entire reach. Stream depth and wetted width are measured at very tightly spaced intervals, whereas channel cross-section profiles, substrate, bank characteristics and riparian vegetation structure are measured at larger spacings. Woody debris is tallied along the full length of the sampling reach, and discharge is measured at one location. The tightly spaced depth and width measures allow calculation of indices of channel structural complexity, objective classification of channel units such as pools, and quantification of residual pool depth, pool volume, and total stream volume.

There are five different components of the WSA physical habitat characterization, including stream discharge, thalweg profile, substrate cross-section, large woody debris, and channel and riparian vegetation structure. Measurements are recorded on 11 copies of a two-sided field form, plus separate forms for recording slope and bearing measurements, recording observations

concerning riparian legacy (large) trees, assessing the degree of channel constraint, and recording evidence of debris torrents or recent major flooding. The thalweg profile is a longitudinal survey of depth, habitat class, presence of soft/small sediment deposits, and presence of off-channel habitat at equally spaced intervals along the centerline between the two ends of the sampling reach. "Thalweg" refers to the flow path of the deepest water in a stream channel. Wetted width is measured and substrate size is evaluated at equally spaced cross-sections. Data for the woody debris tally large woody debris are recorded for each segment of stream located between the regular transects. The third component, the channel and riparian characterization, includes measures and/or visual estimates of channel dimensions, substrate, fish cover, bank characteristics, riparian vegetation structure, evidence of human disturbances, and presence of large (legacy) riparian trees. These data are obtained at each of the equally-spaced transects established within the sampling reach. In addition, measurements of the stream slope and compass bearing between stations are obtained, providing information necessary for calculating reach gradient, residual pool volume, and channel sinuosity. The fourth component, assessment of channel constraint, debris torrents, and major floods, is an overall assessment of these characteristics for the whole reach, and is undertaken after the other components are completed.

The following narratives were derived from field data forms completed following the methods described above. Copies of these data forms are available for review upon request.

3.0 NARRATIVES

Abernathy Creek

Abernathy Creek was surveyed 4/6/2006

This large stream shows significant amounts of exposed bedrock, but has mostly boulder/cobble substrate with large pockets of gravels at the crossing site. WDFW spawning and habitat survey flagging is present throughout. This stream, along with Germany Creek, is part of the WDFW Intensively Monitored Watersheds Program. Redds evident upstream of crossing location during reconnaissance surveys in December 2005. Stream is well confined by boulder/bedrock banks and a deep valley, with roads present within 300 feet of the stream. Minimal floodplain areas are present due to geomorphic constraint rather than roads or floodplain fills. The Measured wetted width at the time of survey was 7.5 meters, with OHW width of 13 meters at 1.4 meters above wetted depth. Gradient is roughly 4% over the 200-meter survey reach. Slide Creek Rd. Bridge is located just upstream of survey area and constricts stream slightly. Water quality appeared very good at winter base flow, and during spring surveys. Riparian area is narrow band of mature cottonwoods and alder, with few conifers and one home site encroaching along top of the west bank.

Erosion Potential = Low

Tributary 1 to Abernathy

No access

Erosion Potential = NA

Tributary 2 to Abernathy

No access

Erosion Potential = NA

Cameron Creek

Cameron Creek was surveyed on 3/27/2006

Cameron Creek is a left bank tributary to Abernathy Creek, at roughly river mile 0.3. The stream is highly confined within a steep v-shaped valley, with bedrock outcroppings common through the surveyed reach. Riparian vegetation is mature mixed conifer forest on steep valley walls, providing excellent cover and recruitment potential. An abandoned roadbed is present within 30 feet of the east stream bank, but does not affect morphology or bank stability. Substrate is primarily cobble and gravel, with few fines and some bedrock outcroppings. Measured wetted width was 8.8 meters, with a measured OHW width of 11 meters at .4 meters above wetted depth. Gradient was approximately 5% over the 200 meter survey reach. Water quality appeared good confirmed by the presence of some intolerant macroinvertebrate species.

Erosion Potential= Low

Tributary to Cameron Creek

Tributary to Cameron Creek was surveyed on 5/9/2006

This unnamed left-bank tributary to Cameron Creek flows down the steep v-shape valley of Cameron Creek, and has a number of gradient and hydraulic passage barriers between the mouth and the crossing location. The stream was of insufficient size to conduct physical inventory, but has an intact mature riparian forest with a mixture of species and strata. Large woody debris is relatively abundant. The stream flows through a 20-inch ABS-pipe culvert under Cameron Creek Road, which is undersized, causing deposition at the inlet. The outlet is perched and a barrier to fish passage. Stream banks are well vegetated and stable.

Erosion Potential= Low

Germany Creek

No Access

Erosion Potential = NA

Fall Creek

No Access

Erosion Potential = NA

Harmony Creek

Harmony Creek was surveyed on 4/22/2006

At the proposed crossing location, Harmony Creek is a 1.0-2.0% gradient stream, recovering from the open-cut trench crossing of the Kelso-Beaver pipeline installation, estimated to be 3-5 years old. Stream morphology appears perturbed but stabilizing with some scoured banks and displaced, imported "spawning gravel" from the restoration effort. Riparian vegetation at the crossing site is primarily sapling alder and native shrubs in a narrow band, with blackberry and reed canarygrass observed throughout. Bankfull width is approximately 5 meters, with an open, accessible floodplain at 0.3 meters above the wetted channel. Habitat features present included some man-made LWD jams, and submerged logs in a large pool immediately upstream of the pipeline crossing. No spawning habitat for large salmonids was present, but gravels adequate for resident fish was observed. Fine sediments were present throughout, and water quality appeared good during the survey (50.0°F).

Erosion Potential= Moderate

Tributary to Harmony Creek

Tributary to Harmony Creek was surveyed on 5/9/2006

This small, unnamed tributary to Harmony Creek had insufficient size to conduct full surveys. The stream channel and riparian area were walked in order to characterize the site. At the crossing location the wetted channel is approximately 1.0 meters wide at base Spring flow, with a bankfull width of 2.5 meters. The riparian buffer is densely vegetated providing good cover, LWD, and contributing to stable banks and generally high water quality. Substrate is primarily gravel and sand, with evidence of slight embeddedness. The stream flows through a perched, 18-inch metal culvert placed deep into a logging road prism. No plunge pool is present at the 1.2 meter drop, which is a passage barrier to fish.

Erosion Potential= Low

Brock Creek

Brock Creek was surveyed on 4/27/2006

This small headwater stream was of insufficient size to conduct full surveys, but rapid habitat assessments were conducted. This is a low-gradient upper watershed stream characterized by glide-pool habitats, heavy sand/silt substrate and a meandering, incised channel. Brock Creek falls within the Kelso-Beaver Pipeline ROW, and riparian vegetation is maintained but still providing good cover. Riparian vegetation is mixed forested wetland species. Depth at the time of the surveys ranged from 4 to 12 inches.

Erosion Potential= Moderate

Tributary 1 to Brock Creek

Survey information not available.

Tributary 2 to Brock Creek

Surveyed 4/27/2006

This small headwater stream flows through densely vegetated riparian buffer with mixed species and age classes present. The small stream size prevented use of full survey methods, and the flow went subsurface approximately 300 feet upstream of Grasseh Poston Rd. Substrate is sand/silt with some pocket gravels. The soil streambanks were actively eroding, and incisement was evident from recent freshets.

Erosion Potential= High

Tributary 3 to Brock Creek

Surveyed 4/27/2006

This headwater tributary to Tributary 2 of Brock Creek originates from drain-tiles under a pasture, and flows into a roadside ditch along Grasseh Poston Rd. The streambed is primarily deeply embedded cobble and sand/silts, with simplified habitat, poor to absent riparian cover or function, and poor water quality. The left bank opposite the road was better vegetated and more stable than the embankment fill along the right bank.

Erosion Potential= High

Coal Creek

Surveyed 4/26/2006

Coal Creek is a large tributary to Coal Creek Slough on the Columbia River. The stream corridor is situated between encroaching roadways near the tops of both streambanks, but lies within a natural, shallow, incised bedrock valley, approximately 20 feet deeper than bankfull depth. The crossing is situated approximately 50 feet downstream of a deep (> 1.5 meters) plunge pool formed by a natural waterfall over bedrock outcropping. The outcropping was manipulated at some time to create a now-defunct dam and water collection impoundment. Despite the road proximity, riparian function remains high, though LWD recruitment potential is low, as evidenced by a general lack of LWD in-stream. Substrate was cobble/gravel, with little sign of embeddedness. The crossing site was open-cut trenched for the installation of the Kelso-Beaver Pipeline, and the site shows signs of this disturbance. Woody debris was placed a

downstream of the crossing presumably for mitigation for habitat effects. Wetted width ranged from 9 to 18.5 feet, and bankfull width ranged from 9.1 to 21.4 feet.

Erosion Potential= Low

Tributary 1 to Coal Creek

Surveyed 5/10/2006

No channel evident at site

Tributary 2 to Coal Creek

Surveyed 5/10/2006

No channel evident at site

Tributary 3 to Coal Creek

Surveyed 5/10/2006

No channel evident at site

Tributary 4 to Coal Creek

Surveyed 5/10/2006

No channel evident at site

Tributary 5 to Coal Creek

Surveyed for wetland resources only and will be revisited for potential fisheries habitat function. This stream is identified as “Mosquito Creek” on some local maps. The wetland report describes this stream as follows: This is a low gradient perennial stream located on tax lot WM3513002. There were several seeps on the east hillside that contribute to this stream. Unnamed Tributary 5 to Coal Creek is associated with Wetland B0425 and is approximately 4 to 6 feet wide at OHWM.

Erosion Potential= N/A

Clark Creek

Surveyed 5/9/2006

This small stream is a direct tributary to Coal Creek Slough. Wetted width at the time of the surveys averaged 1.3 meters, with a bankfull width of 2.6 meters. Substrate was hardpan siltstone, silt, and highly embedded gravels. The stream flows through a steep v-shaped valley, and the streambed was scoured to bedrock in many areas. Riparian vegetation is a dense mix of deciduous and coniferous shrubs and small trees. Some pockets of Japanese knotweed were recorded at the crossing site.

Erosion Potential= Moderate

Tributary 2 to Clark Creek

Surveyed for wetland resources only and will be revisited for potential fisheries habitat function. Tributary 2 to Clark Creek is located on tax lot WI0601001. It is a low gradient perennial stream that originates at headwater Wetland C0511. The stream flows west, roughly following the

proposed centerline, through Wetlands B0511, E0511, and F0511. It is 3 to 6 feet wide based on observed OHWM indicators.

Erosion Potential= N/A

Leckler Creek

Surveyed 5/8/2006

Leckler Creek is a Cowlitz River tributary with significant importance as habitat for several species of listed salmonid. The pipeline route has been modified to avoid crossing Leckler Creek, but the stream does flow through the northern part of the proposed right of way. In the ROW, the stream flows from a concrete box culvert under Hwy 411 and through a deeply incised, soil channel. The area is grazed, and the stream banks are eroding and unvegetated through much of the reach. Until recently, a beaver dam held an impoundment at the outlet of the culvert, but the dam has failed, leaving a trapezoidal channel with wide shallow flow. Wetted width at the time of the survey was 1.3 meters with approximately 3 centimeters of flow. Beaver activity has influenced stream morphology throughout. Riparian vegetation consists of mature alder and willow with native shrubs, but very few conifers.

Erosion Potential= High

Tributary 3 to Leckler Creek

Surveyed 5/10/2006

This headwater tributary to Lecker Creek was evaluated with the rapid assessment only due to its small size and lack of flow. This stream flows under quarry road through a 10-inch corrugated metal pipe culvert that is perched with an 8 inch drop onto rocks. A distinct channel is present with a wetted width of approximately 8 inches and a bankfull width of about 3 feet. Substrate is fine gravel with some embeddedness observed. Riparian vegetation is a mix of mature deciduous trees and scattered conifers with good strata of native shrubs and herbs.

Erosion Potential= Moderate

Cowlitz River

Surveyed 5/8/2006

The Cowlitz River is a major tributary to the Columbia River, entering near the City of Longview. Site conditions at the proposed crossing location were taken from the west bank near the mouth of Leckler Creek. As expected with a large, low gradient river, substrate is primarily sand and silt. The river banks on the east side of the river at the crossing have been hardened with riprap, and a dike appears to be present at the top of the both banks. A large stand of non-native scotch broom is present immediately upstream of the crossing location, but downstream, both banks are dominated by mature alder and cottonwood. The riparian buffer width appears narrow due to agricultural and commercial land use.

Erosion Potential= Low

Ostrander Creek

Surveyed 5/8/2006

Ostrander Creek is a tributary to the Cowlitz River. When surveyed, the stream wetted width averaged approximately 10 feet, with bankfull widths ranging from 17.0 to 30.2 feet. Stream gradient is 3 to 4% in the crossing area, and frequent floodplain interaction is evident. Substrate is cobble and gravel that is relatively free of embeddedness. LWD is present in log jams and as single pieces. Riparian function is relatively high, with a mix of mature cedar and fir trees, mature deciduous trees, and dense shrub and herb growth. Riparian shading is excellent.

Erosion Potential= Low

Tributary 2 to Ostrander Creek

Not Accessible

Tributary 1 to Ostrander Creek

Surveyed 5/11/2006

This slough-like tributary to Ostrander Creek flows along the west side of Pleasant Hill Rd. The stream appeared slack, with no visible surface flow during the survey. Riparian vegetation is primarily invasive reed canarygrass. A visible sheen of oil was noted during the survey, along with a vegetative odor. The source of the sheen may have been organic in nature or spill/runoff from the nearby railroad or roadway. Substrate is entirely silt and organic debris.

Erosion Potential= High

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